



# FLUSH MOUNT SOLAR CHARGER

USER MANUAL

MODEL: TRAVELPRO 30





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Thank you for selecting the Merlin Optimized series solar charge controller. Please read this manual carefully before using the product and pay attention to the safety information. Please preserve this manual for future reference.

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## IMPORTANT SAFETY INSTRUCTIONS

This manual contains all instructions of safety, installation, and operation of Merlin Optimized series controller (referred to as “the controller” in this manual).

- Read all the instructions and warnings carefully before installation.
- No user-serviceable component inside the controller. DO NOT disassemble or attempt to repair the controller.
- Avoid direct sunlight, high temperatures and DO NOT install the controller at locations where water can get in.
- Install the controller at well-ventilated places, the controller’s heat sink will be very hot during the system operation.
- Appropriate external fuses or breakers are suggested.
- Please cut off all connections of the PV array, fuses or breakers which are close to the battery before the controller installation and adjustment.
- Power connections must remain tight to avoid excessive overheating from loose connection.

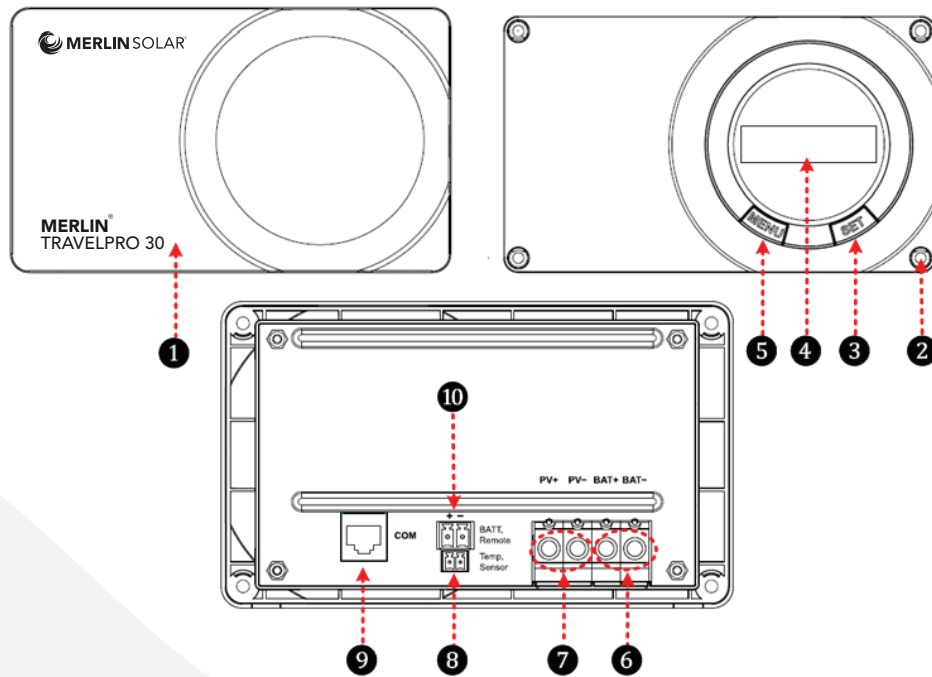
# OVERVIEW

The controller is a negative-ground, flush mount solar charge controller, designed for an aesthetically clean and integrated look on RV and Vessel, also included surface mount cover to suit personal preference. It adopts a highly efficient PWM charging mode and also comes equipped with a special LCD display to show the real-time operating status of the system. This charge controller is fully controlled automatically, which provides simple usage pattern to users.

## FEATURES

- Flush mounted and embedded installation design
- High quality and low failure rate components (ST/IR) to ensure the product lifetime
- 3-Stage intelligent PWM charging: Bulk, Boost/Equalize and Float
- Battery type: Sealed, Gel, Flooded, and User
- Real-time energy statistics feature
- Battery temperature compensation feature
- Digital LCD monitor for informative display of operational parameters and fault messages
- Voltage drop and temperature compensation sampling interface design
- RS485 communication port with Modbus protocol, and short circuit protection for 5V/200mA power supply
- Multiple communication peripherals
- Rated charging current at working temperature without de-rating
- Extensive electronic protections
- Monitor and set the parameters via PC software or APP

# EXTERIOR



- |   |                                 |    |   |
|---|---------------------------------|----|---|
| 1 | CONTROLLER CASE                 | 6  | BATTERY TERMINALS                                 |
| 2 | MOUNTING HOLE SIZE $\Phi$ 4.5MM | 7  | PV TERMINALS                                      |
| 3 | SET BUTTON                      | 8  | REMOTE TEMPERATURE SENSOR PORT <sup>(1)</sup>     |
| 4 | LCD                             | 9  | RS485 COMMUNICATION PORT                          |
| 5 | MENU BUTTON                     | 10 | REMOTE BATTERY VOLTAGE SENSOR PORT <sup>(2)</sup> |

(1) The controller will charge the battery at 25°C as default and no temperature compensation when the temperature sensor is damaged.

(2) The port can detect accurate battery voltage (a 2P/1.5mm<sup>2</sup> wire (Red +ve, Black -ve) with insulation protection is suggested). One end connects the 5.08-2P terminal to insert 10 port, the other end connects the battery, and make sure the "+" and "-" poles are connected correctly.

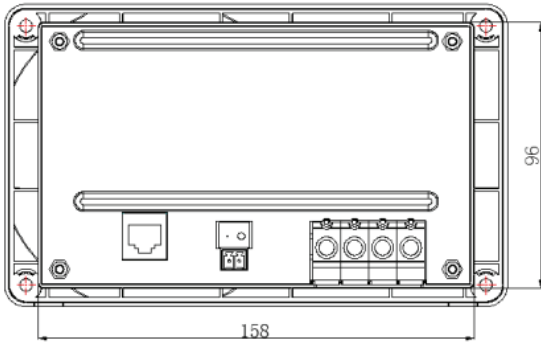
# INSTALLATION AND WIRING

## 3.1 INSTALL THE CONTROLLER

1) Determine the Installation Location and Heat-dissipation Space

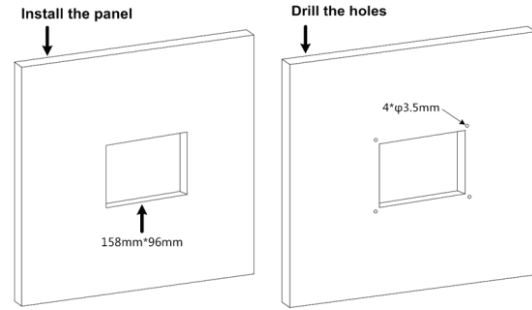
Determination of installation location: The controller shall be installed in a place with sufficient air flow through the radiators of the controller and a minimum clearance of 150mm from the upper and lower edges to ensure natural thermal convection.

2) Determine the size of Installation Location (158\*96mm)

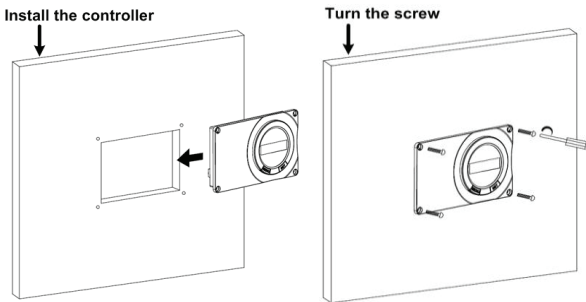


3) Cut out the section (158\*96mm)

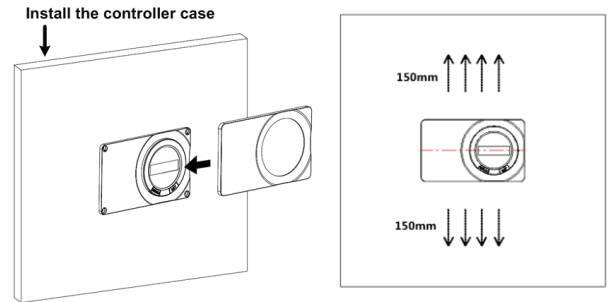
4) Mark holes and drill holes  $\phi 3.5\text{mm} \times 4$



5) Secure the controller



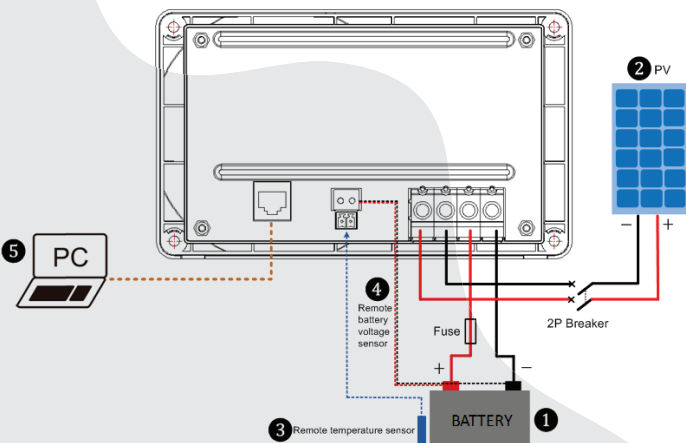
6) Install the control case



## 3.2 WIRING

**Step 1: Connect the battery 01**

CAUTION: A fuse in which current is 1.25 to 2 times the rated current of the controller must be installed on the battery side with a distance from the battery not greater than 150 mm.



**Step 2: Connect the PV 02**

CAUTION: While wiring the controller do not turn on the breaker or fuse and make sure that the leads of "+" and "-" poles are connected correctly.

CAUTION: If the controller is used in an unguarded or frequent lightning area, must install a reasonable arrester in the PV array input side.

**Step 3: Connect the Remote temperature sensor cable 03**

NOTE: The controller will charge or discharge the battery at 25°C as default and no temperature compensation when the temperature sensor is damaged.

**Step 4: Connect the Remote battery voltage sensor 04**

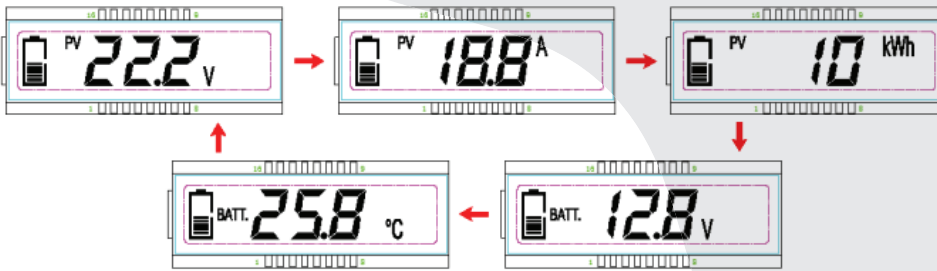
CAUTION: Make sure that the battery voltage sensor cable of "+" and "-" poles are connected correctly when wiring.

**Step 5: Connect the PC via the RS485 communication port 05**

Refer to chapter 4 "Remote set battery type".

# LCD DISPLAY

## 1) AUTOMATIC CYCLE INTERFACE



Display: PV voltage, PV current, PV power, Battery voltage and Battery temperature

## 2) CLEAR THE GENERATED ENERGY

### Operation

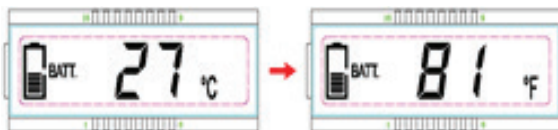
**Step 1:** Press the "SET" button and hold down for 5s under the PV power interface and the value is flashing.

**Step 2:** Press the "SET" button to clear the generated energy.



## 3) SWITCH THE BATTERY TEMPERATURE UNIT

Press the "SET" button and hold down for 5s under the battery temperature interface.



## 4) BATTERY TYPE

Battery type - Sealed Gel Flooded User<sup>(1)</sup>

Set battery type by LCD<sup>(1)</sup>

### Operation

**Step 1:** Press the "SET" button and hold down for 5s under the battery voltage interface.

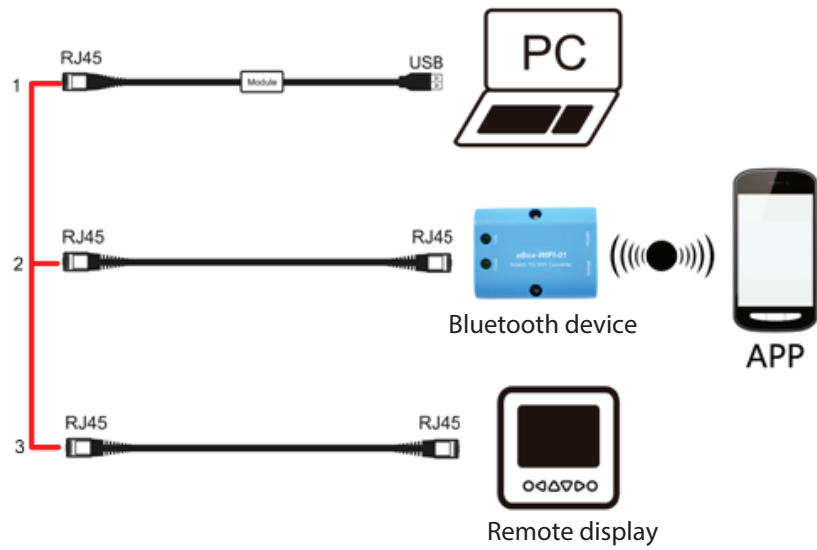
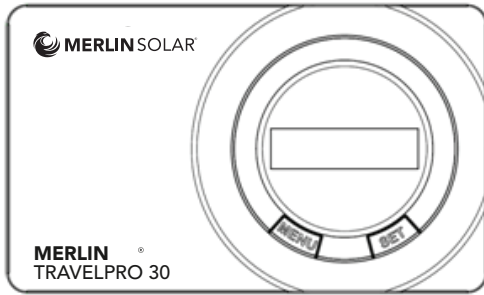
**Step 2:** Press the "MENU" button when the battery type interface is flashing.

**Step 3:** Press the "SET" button to confirm the battery type.





## Set battery type by PC<sup>(1)</sup>



(1) Only Sealed, Gel and Flooded via the LCD. The battery type of User can be set via the PC software, APP software and MT50.



## 5) SYSTEM STATUS ICON

ICON	PHENOMENON	INSTRUCTION
	Solid	The system is normal but not charging
	Energy bars are Flashing	Charging
	Solid	Full
	Flashing	Battery Overvoltage
	Flashing	Battery Over Discharge

# PROTECTION

PROTECTION	INSTRUCTION
<b>PV Overcurrent</b>	When the charging current of the PV array exceeds the controller's rated current, it will be charged at the rated current.
<b>PV Overvoltage</b>	When the voltage of PV exceeds 50V, the controller will stop charging and restart to charge when the PV voltage is below 45V.
<b>PV short circuit</b>	When the PV voltage is below 50V and short circuit, the controller will stop charging; the controller will restart to charge when the fault is cleared, it doesn't damage the controller.
<b>PV Reverse Polarity</b>	When the polarity of the PV array is reversed, the controller may not be damaged and can continue to operate normally after the polarity is corrected.
<b>Night Reverse Charging</b>	Prevents the battery from discharging to the PV module at night.
<b>Battery Reverse Polarity</b>	Fully protected against battery reverse polarity; no damage will occur to the battery. Correct the wiring error to resume normal operation.
<b>Battery Overvoltage</b>	When the battery voltage reaches the overvoltage disconnect voltage, it will automatically stop battery charging to prevent battery damage caused by over-charging.
<b>Battery Overheating</b>	The controller can detect the battery temperature through an external temperature sensor. The controller stops working when its temperature exceeds 65°C and restart to work when its temperature is below 55°C.
<b>Controller Overheating</b>	The controller is able to detect the temperature inside the battery. The controller stops working when its temperature exceeds 85°C and restart to work when its temperature is below 75°C.
<b>TVS High Voltage Transients</b>	The internal circuitry of the controller is designed with Transient Voltage Suppressors (TVS) which can only protect against high-voltage surge pulses with less energy. If the controller is to be used in an area with frequent lightning strikes, it is recommended to install an external surge arrester.

# TROUBLESHOOTING

FAULTS	POSSIBLE REASONS	TROUBLESHOOTING
The PV of LCD display 0 when the sunshine falls on PV modules properly	PV array disconnection	Confirm that PV wire connections are correct and tight.
LCD is no display	Min.8V will start up the controller	Measure battery voltage with multi-meter. Minimum 8V can start up the controller.
 Flashing	Battery Overvoltage	Disconnect the solar array and measure the battery voltage whether it is too high.
 Flashing	Battery Over Discharge	Charge the battery.

# TECHNICAL SPECIFICATIONS

## Electrical Parameters

ITEM	TRAVELPRO30
Nominal System Voltage	12/24VDC or Auto
Battery Input Voltage Range	8V~32V
Rated Charge Current	30A
Max. PV Short Circuit Current	30A
Max. PV Open Circuit Voltage	50V
Battery Type	Sealed (default)/Gel/Flooded/User*
Self-consumption	≤ 4.2mA/12V; ≤ 2.6mA/24V
Temperature Compensate Coefficient	-3mV/°C/2V (Default)
Charge Circuit Voltage Drop	0.21V

\*The battery type of User can be set via the PC software, APP software and MT50.

## Environmental Parameters

ITEM	TRAVELPRO30
Storage Temperature Range	-30°C~+80°C
Working Environment Temperature	-20°C~+55°C (100% input and output)
Relative Humidity	≤95%, N.C.
Enclosure	IP30
Grounding	Common negative
Altitude	5000m
Pollution Degree	PD2

## Mechanical Parameters

ITEM	TRAVELPRO30
Dimension (L×W×H)	178.5×105.5×48.3mm
Mounting Dimension	166.5×93.5mm
Mounting Hole Size	∅5mm
Terminal	16mm <sup>2</sup> /6AWG
Recommended Cable	10mm <sup>2</sup> /8AWG
Net Weight	0.31kg

## Lead-acid Battery Voltage Parameters

Parameters are in the 12V system at 25°Cx2 in 24V.

ITEM	SEALED	GEL	FLOODED	USER
Overvoltage Disconnect Voltage	16.0V	16.0V	16.0V	9~17V
Charging Limit Voltage	15.0V	15.0V	15.0V	9~17V
Overvoltage Reconnect Voltage	15.0V	15.0V	15.0V	9~17V
Equalize Charging Voltage	14.6V	—	14.8V	9~17V
Boost Charging Voltage	14.4V	14.2V	14.6V	9~17V
Float Charging Voltage	13.8V	13.8V	13.8V	9~17V
Boost Reconnect Charging Voltage	13.2V	13.2V	13.2V	9~17V
Low Voltage Reconnect Voltage	12.6V	12.6V	12.6V	9~17V
Under Voltage Warning Reconnect Voltage	12.2V	12.2V	12.2V	9~17V
Under Volt. Warning Volt.	12.0V	12.0V	12.0V	9~17V
Low Volt. Disconnect Volt.	11.1V	11.1V	11.1V	9~17V
Discharging Limit Voltage	10.6V	10.6V	10.6V	9~17V
Equalize Duration	120 min.	—	120 min.	0~180 min.
Boost Duration	120 min.	120 min.	120 min.	10~180 min.

(1) When the battery type is sealed, gel, flooded, the adjusting range of equalizing duration is 0 to 180min and boost duration is 10 to 180min.

(2) The battery type of User should follow the rules as below when modifying the value of parameters in user battery type (factory default value is the same as sealed type):

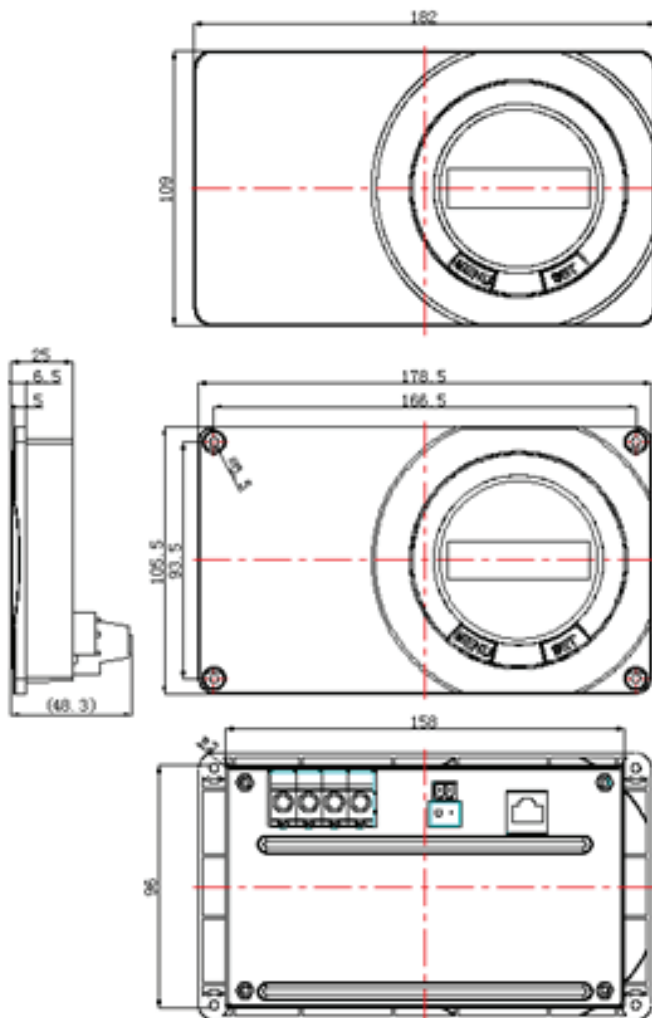
- a. Overvoltage Disconnect Voltage > Charging Limit Voltage ≥ Equalize Charging Voltage ≥ Boost Charging Voltage ≥ Float Charging Voltage > Boost Reconnect Charging Voltage.
- b. Overvoltage Disconnect Voltage > Over Voltage Reconnect Voltage.
- c. Low Voltage Reconnect Voltage > Low Voltage Disconnect Voltage ≥ Discharging Limit Voltage.
- d. Under Voltage Warning Reconnect Voltage > Under Voltage Warning Voltage ≥ Discharging Limit Voltage.
- e. Boost Reconnect Charging voltage > Low Voltage Disconnect Voltage.

# DISCLAIMER

The following situations are not covered by the company policy of warranty:

- Damage from improper use or use in an unsuitable environment.
- PV or load current, voltage or power exceeding the rated value of the controller.
- The controller working temperature exceeds the range of working temperature.
- User disassembles and attempts to repair the controller without permission.
- The controller is damaged due to natural causes such as lightning.
- The controller is damaged during transportation and shipment.

# DIMENSIONS





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